SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-40

Name: Oak Lake **County**: Brookings
Legal Description: T110N- R48W-Sec 1, 12, 13; T112N-R47W-Sec 7, 18
Location from nearest town: 6 miles north and 5 miles east of White, SD

Dates of present survey: July 2-3, 2007
Dates of last survey: July 5-6, 2005

Primary Game and Forage Species	Other Species
Walleye	Northern Pike
Yellow Perch	Common Carp
	Black Bullhead
	White Sucker
	Bigmouth Buffalo
	Saugeye

PHYSICAL DATA

Surface Area: 396 acres **Watershed area**: 4,480 acres
Maximum depth: 6 feet **Mean depth**: 4 feet
Volume: 1,560 acre feet **Shoreline length**: Unknown
Contour map available: Yes **Date mapped**: 1956
Lake elevation observed during the survey: Full

Introduction

Oak Lake is located in the northeast corner of Brookings County on the east slope of the Coteau des Prairie. It was named for the abundance of oak trees surrounding the shoreline. The lake receives its water from watershed runoff and a limited aquifer connection. Overflow runs northeast into Fish Lake in Deuel County then east into Minnesota.

Ownership of Lake and Adjacent Lakeshore Property

Oak Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. The ordinary high water mark was set at an elevation of 1802.3 and the outlet elevation at 1801.8 in 1983. GFP owns and manages a small lake access area on the northeast corner of the lake. The remainder of the shoreline is privately owned.

Fishing Access

The Oak Lake Access Area has a single lane, concrete plank boat ramp that is in poor condition and there is little room for parking. Shore fishing opportunity is limited to the access area. The lake is a popular ice fishing location for walleye and yellow perch.

Field Observations of Water Quality and Aquatic Vegetation

The water in Oak Lake had a Secchi depth measurement of 0.3 m (12 in) due to algae. Sago pondweed (*Potamogeton pectinatus*) was also observed.

BIOLOGICAL DATA

Methods:

Oak Lake was sampled on July 2-3, 2007 with 2 overnight gill-net sets and 4 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Black bullhead (57.4%) was the most abundant species sampled in the gill nets this year (Table 1). Other species sampled included walleye, yellow perch, northern pike, white sucker, and orange-spotted sunfish.

Table 1. Total catch from two overnight gill net sets at Oak Lake, Brookings County, July 2-3, 2007.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	105	57.4	52.5	±28.8	34.3	7	0	91
Walleye	48	26.2	24.0	±2.6	0.8	48	3	101
Yellow Perch	16	8.7	8.0	±5.1	24.9	48	1	92
Northern Pike	11	6.0	5.5	±4.5	4.9	36	0	86
White Sucker	2	1.1	1.0	±1.3	2.8	--	--	--
O. S. Sunfish	1	0.5	0.5	±0.6	0.0	--	--	--

* 5 years (1995, 1998, 2000, 2003, 2005)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullheads (96.5%) dominated the trap net catch (Table 2). Other species sampled included yellow perch, northern pike, walleye, and orange-spotted sunfish.

Table 2. Total catch from four overnight trap net sets at Oak Lake, Brookings County, July 2-3, 2007.

Species	#	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	1,216	96.5	304.0	±147.9	213.6	19	0	85
Yellow Perch	27	2.1	6.8	±2.4	5.1	35	25	89
Northern Pike	12	1.0	3.0	±2.2	2.5	52	0	82
Walleye	4	0.3	1.0	±0.9	0.1	--	--	--
O. S. Sunfish	1	0.1	0.3	±0.3	0.0	--	--	--

* 7 years (1991, 1993, 1995, 1998, 2000, 2003, 2005)

Walleye

Walleye gill-net CPUE increased dramatically to 24.0 this year (Table 3). It appears the 2004 and 2006 stockings (Table 7) produced moderate year classes (Figure 1). Recent walleye stockings have been as successful as the saugeye stockings in the mid to late 90's. The mean saugeye gill-net CPUE from 1998-2003 was 21.5 (Table 6) which is similar to the 2007 walleye CPUE. Like saugeye, walleyes grow quickly in Oak Lake (Figure 1). Several of the remaining large saugeye (up to 8 pounds) were reportedly caught by anglers in early December.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 1996-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE								4.0		24.0
PSD								0		48
RSD-P								0		3
Mean Wr								99		101

Yellow Perch

Yellow perch gill net CPUE decreased to 8.0 (Table 4) due to limited recruitment. Juvenile yellow perch (4,170) marked with oxytetracycline (OTC) were stocked in 2006 but no fluorescent marks were found on the otoliths of the nine fish sampled in the gill nets and CPUE did not increase.

Table 4. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE	11.3		6.3			36.0		10.3		8.0
PSD	47		82			81		55		48
RSD-P	9		6			10		3		1
Mean Wr	79		104			--		102		92

Black Bullhead

Black bullhead trap-net CPUE increased to 304.0, PSD decreased to 19 and RSD-P decreased to 0 (Table 5). The length-frequency histograms in Figure 3 illustrate the population contains at least two year classes with an average length of only 155 mm (6.1 in). A mean Wr of 85 indicates the fish are in poor condition.

Table 5. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
CPUE	397.6		49.8			94.4		56.0		304.0
PSD	11		76			43		28		19
RSD-P	0		0			19		23		0
Mean Wr	--		--			--		100		85

All Species

A large number of black bullheads were sampled in 2007 in both gear types (Table 6). Walleyes increased, yellow perch decreased and no saugeye, common carp or bigmouth buffalo were sampled

Table 6. Gill-net (GN) or trap-net (TN) CPUE for all fish species sampled in Oak Lake, Brookings County, 1998-2007.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
COC (GN)	0.7		1.3			0.7		0.3		--
COC (TN)	1.4		0.8			6.2		1.6		--
WHS (GN)	0.7		--			1.3		5.7		1.0
WHS (TN)	1.2		--			0.4		1.2		--
BIB (GN)	--		0.7			50.0		--		--
BIB (TN)	1.0		--			--		0.6		--
BLB (GN)	28.0		110.6			20.0		9.0		52.5
BLB (TN)	397.6		49.8			94.4		56.0		304.0
NOP (GN)	2.7		0.3			0.7		8.0		5.5
NOP (TN)	4.2		0.6			1.8		5.2		3.0
GSF (GN)	--		--			--		--		--
GSF (TN)	--		--			0.2		--		--
OSF (GN)	--		--			--		--		0.5
OSF (TN)	--		--			--		0.2		0.3
YEP (GN)	11.3		6.3			36.0		10.3		8.0
YEP (TN)	4.8		0.6			8.6		1.2		6.8
SXW (GN)	10.3		10.7			43.7		6.7		--
SXW (TN)	1.8		0.4			6.0		2.0		--
WAE (GN)	--		--			--		4.0		24.0
WAE (TN)	--		--			--		1.0		1.0

COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), NOP (Northern Pike), GSF (Green Sunfish), OSF (Orangespotted Sunfish), YEP (Yellow Perch), SXW (Saugeye), WAE (Walleye),

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the Oak Lake fishery by conducting lake surveys every other year with the next occurring in 2009.

2. Consider the use of artificial habitat structures to increase yellow perch spawning success.

3. Encourage commercial fishing for black bullheads whenever they are large enough to harvest and sell.

4. Continue to stock walleye fingerlings every other year. Stock marked yellow perch into voids of natural production. Evaluate stocking by conducting lake surveys and checking for marked fish.

Table 7. Stocking record for Oak Lake, Brookings County, 1991-2007.

Year	Number	Species	Size
1992	250,000	Northern Pike	Fry
	40,207	Yellow Perch	Fingerling
1994	3,360	Fathead Minnow	Adult
	17,020	Yellow Perch	Fingerling
	4,082	Yellow Perch	Adult
1995	65,000	Saugeye	Fingerling
1996	42,000	Saugeye	Fingerling
	3,793	Yellow Perch	Fingerling
1998	2,326	Saugeye	Juvenile
1999	48,750	Saugeye	Fingerling
	4,005	Yellow Perch	Adult
2001	39,900	Saugeye	Fingerling
	5,928	Yellow Perch	Juvenile
2004	39,200	Walleye	Fingerling
2006	40,000	Walleye	Fingerling
	4,170	Yellow Perch	Juvenile

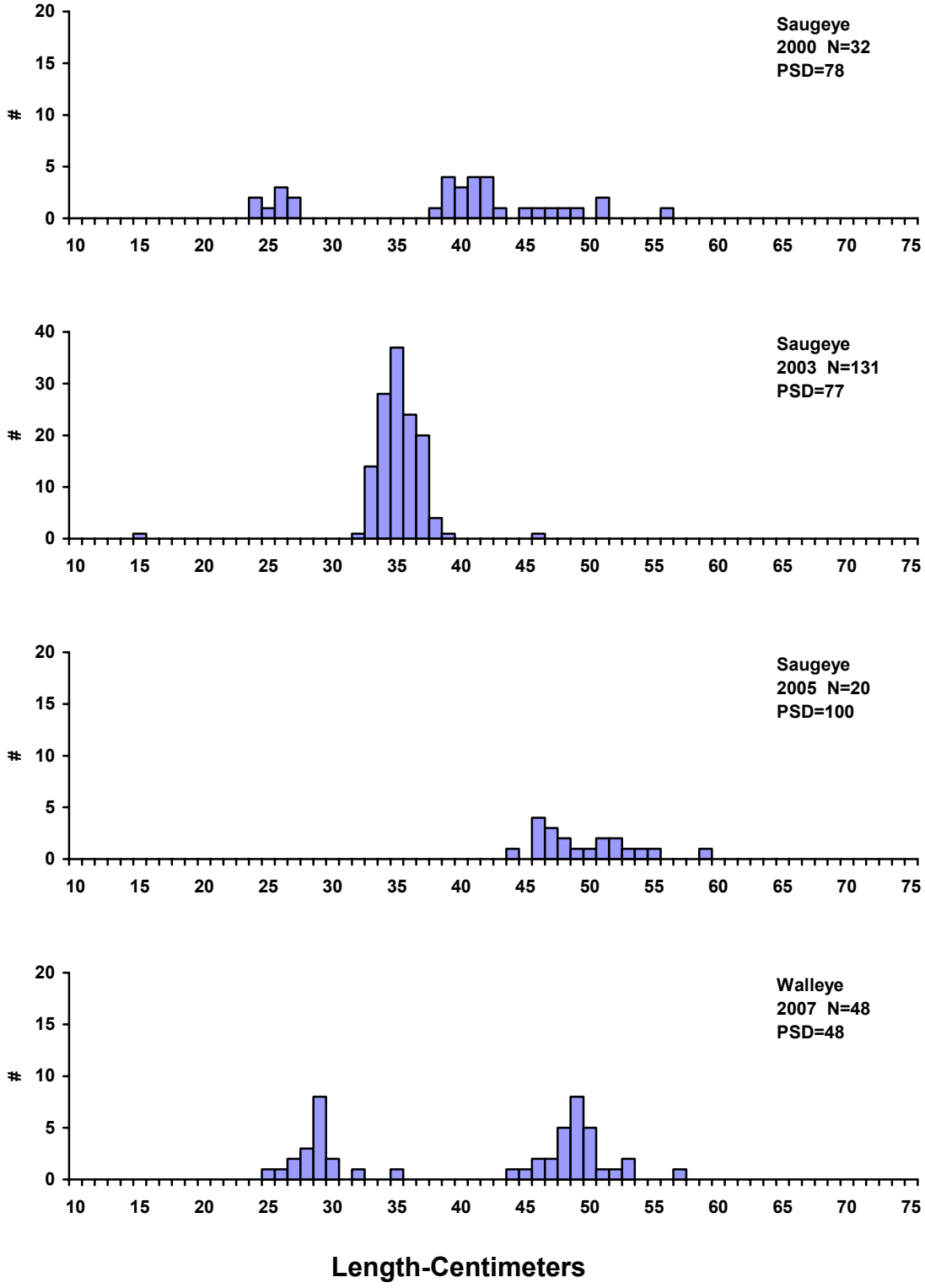

Figure 1. Length frequency histograms for walleye and saugeye sampled with gill nets in Oak Lake, Brookings County, 1998, 2000, 2003, and 2005.

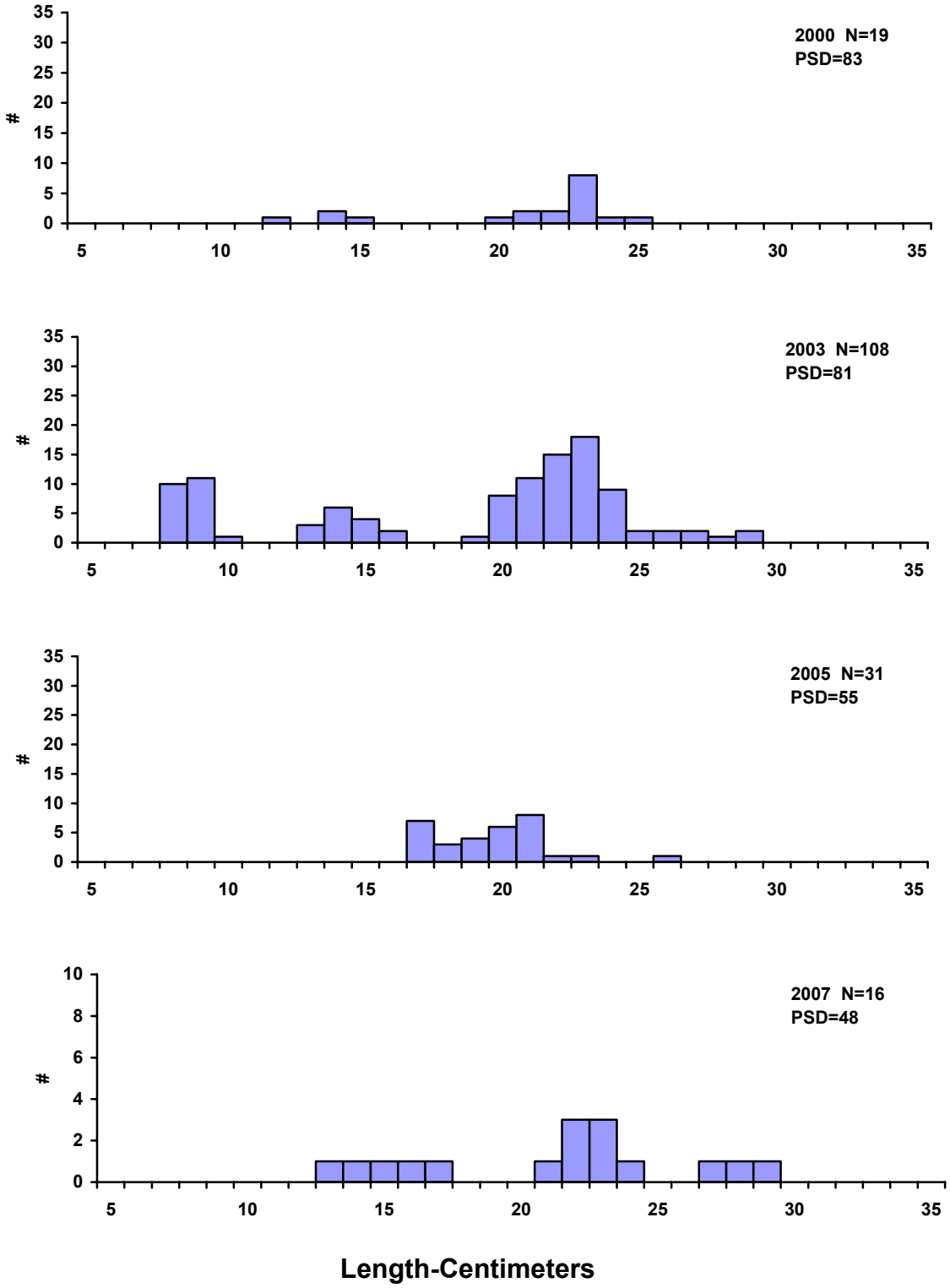

Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Oak Lake, Brookings County, 2000, 2003, 2005 and 2007.

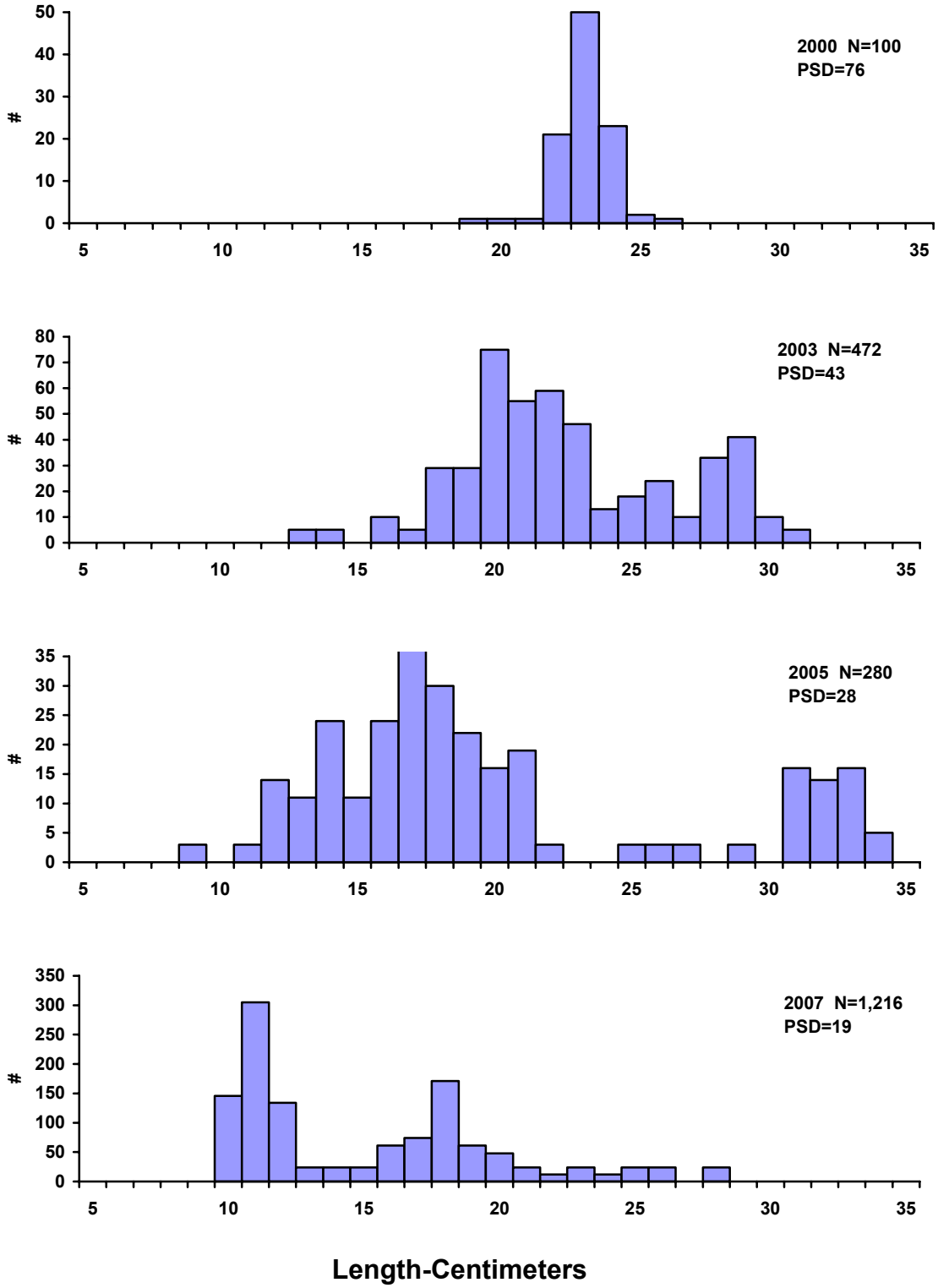

Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Oak Lake, Brookings County, 2000, 2003, 2005 and 2007.

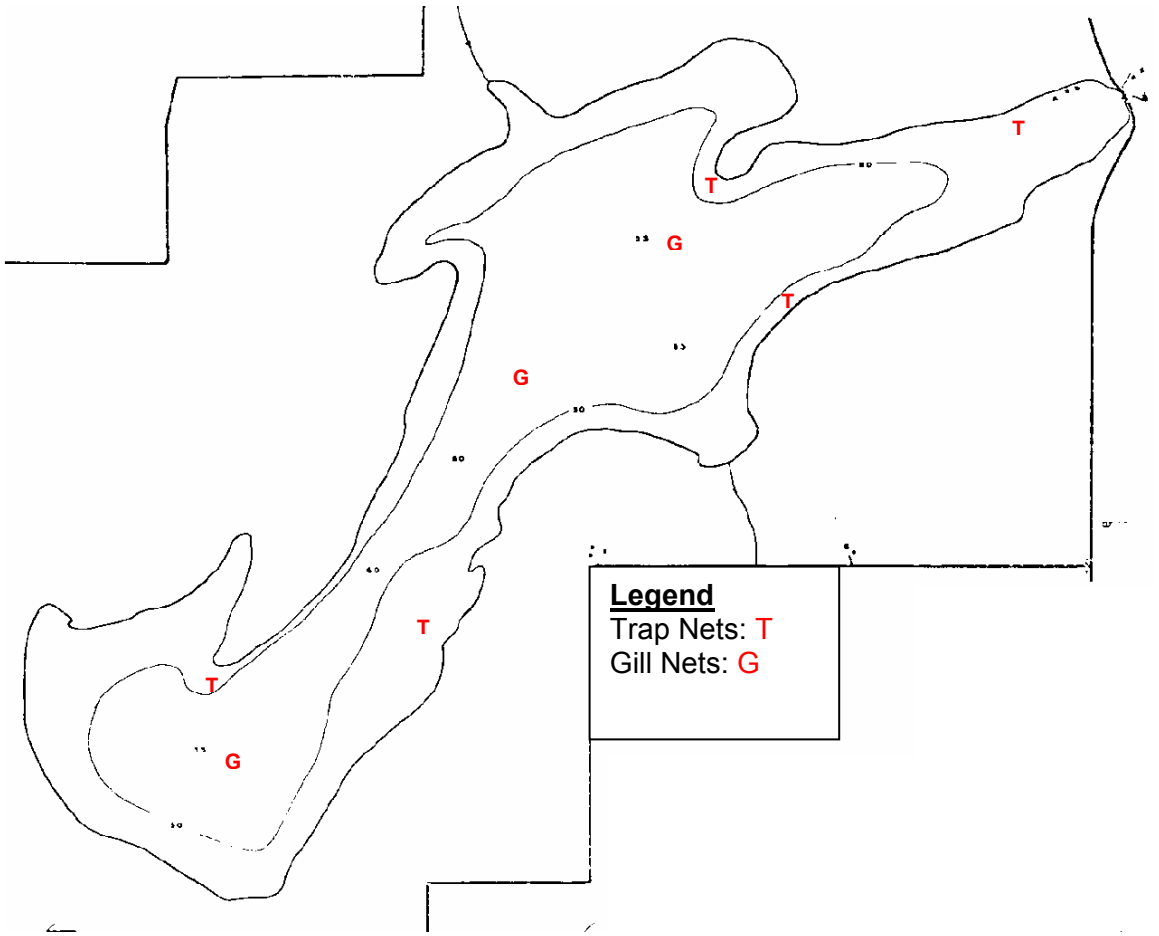

Figure 4. Sampling locations on Oak Lake, Brookings County, 2007.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Saugeye	23	35	46	56	69
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.